

leading to endothelium-dependent dilation) and after sublingual nitroglycerin (GTN, an endothelium-independent dilator).

Vessel size, baseline flow, degree of RH (Doppler estimated) and total cholesterol were similar in both groups. Flow mediated dilation was impaired in the KD patients ($5 \pm 1\%$ versus controls $11 \pm 1\%$, $p < 0.0005$). In contrast, GTN caused dilation in all subjects (KD patients $25 \pm 4\%$ versus controls $23 \pm 2\%$, $p = NS$).

Thus, KD patients have abnormal endothelial function which is present in the systemic arteries late after the acute disease in the absence of coronary artery abnormalities. This may be an important factor in the genesis of late vascular complications.

5:15

762-6 Cerebral Oxygenation During Paediatric Cardiac Surgery: Identification of Vulnerable Periods by Near Infrared Spectroscopy

Piers E.F. Daubeny, Sally Pilkington, David Smith, Robert K. Lamb, James L. Monro, Steven A. Livesey, Victor T. Tsang, Steven A. Webber. *Wessex Cardiothoracic Centre, Southampton General Hospital, Southampton, UK*

Maintenance of cerebral oxygenation is vital in paediatric cardiac surgery. Near infrared spectroscopy (NIRS) can measure regional cerebral oxygenation (rSO₂). As the cerebral microvasculature is predominantly venous by volume, changes in rSO₂ should reflect changes in jugular bulb oxygen saturations (SjO₂). We investigated the role of NIRS (Invos 3100, Somanetics Inc) in 19 children (median age 1.2 years, range 2 weeks–9.7 years) undergoing cardiac surgery (17 with cardiopulmonary bypass, 8 with circulatory arrest). For all patients combined, simple linear regression confirmed a strong relationship between rSO₂ & SjO₂: $rSO_2 = 0.69SjO_2 + 23$, $r = 0.71$, $p < 0.0001$. For individual patients the correlations were closer with a median $r = 0.91$ (range 0.68–0.96).

Prebypass 10/18 patients had a fall in rSO₂ $\geq 15\%$ points for a minimum of 3 minutes. In 5 patients rSO₂ reached $<35\%$. The causes for cerebral desaturation were 1) anaesthetic induced cyanotic spells or cardiac depression in the setting of pre-existing cardiac failure and 2) handling and dissection around the heart prior to and going onto bypass. *Bypass* universally raised the rSO₂ by a mean 18% points to a mean maximum of 75%. *Circulatory arrest* at $<20^\circ$ (11 episodes, mean arrest time 45 minutes, range 23–61) caused the rSO₂ to fall by a mean 0.25%/min. Rate of fall in rSO₂ in 3 patients arrested at $>20^\circ$ was 6–11x higher (1.5–2.7%/min). Rate of decay was correlated with the temperature at onset of arrest ($r = 0.84$, $p = 0.0002$). The mean rSO₂ at the end of arrest was 66 range 30–88). *Reperfusion* following arrest caused an initial mean rise in rSO₂ of 11% (range 2–23) and with rewarming a mean fall of 15% (range 1–30). *Rewarming* in patients not arrested resulted in a mean fall in rSO₂ of 12% (range 2–44). *Discontinuation of bypass* was associated with a further precipitous fall in rSO₂ in 5 patients. Postbypass 3 patients had rSO₂ $<50\%$.

The study shows rSO₂ correlates well with SjO₂ particularly in individual patients. *Prebypass* and early postbypass appear to be vulnerable periods for maintenance of cerebral oxygenation. NIRS is a promising tool for monitoring cerebral O₂ supply/demand relationships in paediatric cardiac surgery, especially during circulatory arrest when no other monitoring modalities are available.

763 Dilated and Hypertrophic Cardiomyopathies: Echocardiographic Evaluation

Tuesday, March 21, 1995, 4:00 p.m.–5:30 p.m.
Ernest N. Morial Convention Center, Room 14

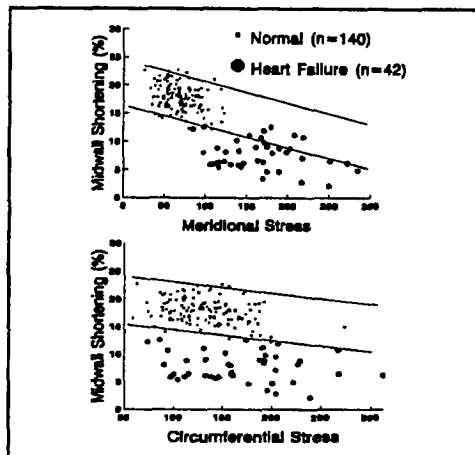
4:00

763-1 Assessment of Left Ventricular Function by Circumferential Stress-Midwall Shortening Relations in Dilated Cardiomyopathy

Annamaria Mucinico, Giovanni de Simone, Mary J. Roman, Robert J. Cody, Richard B. Devereux. *Cornell Medical Center, New York, N.Y.*

Echocardiographic stress endocardial shortening relations provide estimates of LV contractility that do not uniformly detect myocardial dysfunction in dilated cardiomyopathy (DCM). Recently it has become apparent that midwall (mid) fractional shortening and circumferential (c) end-systolic stress (ESS) provide the most appropriate paired afterload and function measures. Both meridional (m) and cESS were related to both endocardial (e) FS and midFS in 42 patients with DCM (98% dead during follow-up; eFS = 4% in the survivor) and in 140 normals. Eight patients (19%) fell into the 95% confidence interval of the normal relation of eFS to mESS (*top panel*), 14% had apparently normal midFS-mESS relations but midFS was depressed in relation to

cESS in 100% of patients (*lower panel*). Thus, (1) use of cESS-shortening relations improves the ability to identify patients with depressed LV function; (2) use of midFS or eFS are equivalent in DCM with LV dilatation and wall thinning.

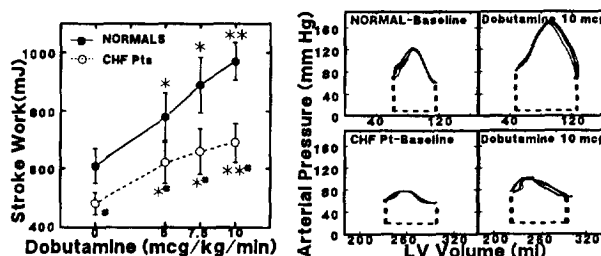


4:15

763-2 Attenuated Contractile Reserve in Chronic Severe Heart Failure: Evaluation by Automated Noninvasive Pressure-Volume Relations and Dobutamine Echocardiography

John Gorcsan III, William E. Katz, Christine Mahler, William A. Mandarino, Robert L. Kormos, Srinivas Murali. *University of Pittsburgh, Pittsburgh, PA*

To determine LV contractile reserve in pts with chronic severe heart failure (CHF), automated estimates of LV volume and noninvasive arterial pressure were used to generate on-line pressure-volume loops. Seven CHF pts, (aged 45 ± 10) with mean LVEF $21 \pm 6\%$ and 10 normal subjects, (aged 32 ± 3 yrs) with LVEF $56 \pm 5\%$ were studied at baseline and during graded dobutamine infusion at 5, 7.5 and 10 $\mu\text{g}/\text{kg}/\text{min}$. LV volume (4-chamber view Simpson's rule) by echo automated border detection and noninvasive arterial pressure using a finger cuff photoplethysmograph were used to construct arterial pressure — LV volume loops. Stroke work (SW), \int pressure d volume, was estimated with an assumed LV diastolic pressure of 20 mmHg for CHF pts and 10 mmHg for controls. Examples and mean \pm SD SW are shown.



Conclusions: Significant differences in baseline LV function were observed between groups. Graded increases in SW occurred with dobutamine inotropic modulation in both groups, although the responses were significantly attenuated in CHF pts ($p < 0.05$). This noninvasive method may be useful to assess LV contractile reserve in chronic CHF pts.

4:30

763-3 Low Dose Dobutamine Echo Doppler Predicts Maximal Oxygen Uptake in Severe Chronic Congestive Heart Failure

Charles E. Olson, Thomas R. Porter, Feng Xie, Maria-Teresa P. Olivari. *University of Nebraska Medical Center, Omaha, Nebraska*

Maximal oxygen uptake (MVO₂) during exercise is an important prognostic factor in severe heart failure (HF), but often these patients cannot exercise. Since Doppler echo measurements of left ventricular outflow (LVO) correlate closely with invasively determined cardiac output (CO), we hypothesized that these measurements during exercise-mimicking pharmacologic stress with dobutamine (D) may be an accurate method of indirectly assessing MVO₂ in patients with chronic heart failure. To test this hypothesis, we administered