TITLE: CLINICAL CORRELATION OF NON-INVASIVE MEASUREMENT OF CARDIAC OUTPUT AND THERMODILUTION TECHNIQUE AMONG SURGICAL INTENSIVE CARE PATIENTS

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Two new forms of non-invasive cardiac output determination were correlated with standard pulmonary artery catheter based thermodilution cardiac output measurements.

Both forms of non-invasive output determination are based on the model of Welkowitz and Fich[1]. In this model, the aorta, with its geometric taper and non-uniform elasticity, is described by a hybrid net work consisting of distributed segments analogous to the elasticity area, viscosity and viscoelasticity of the physiologic system and a lumped inertance of the blood in the aorta. The two non-invasive computation techniques required placement of piezoelectric transducers over the carotid artery and femoral artery to simultaneously record the pulse contours. In the first method (CIRCUIT), the aorta is described as an equivalent lumped circuit based on a description by Watts, which is simulated in a PC-AT equivalent computer utilizing the SPICE circuit analysis program and visually matched femoral waveforms

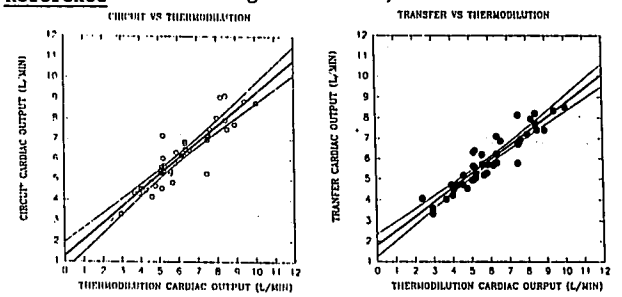
In the second method (TRANSFER) the transfer function is determined from the carotid and femoral arterial waveforms. The parameters of the model function are modified until optimally matched with the measured transfer function, following which conversion to a cardiac output is calculated.

Forty-five patients with pulmonary artery catheters in place were studied. Informed consent was obtained with approval of the Institutional Review Board of the Mount Sinai Hospital. Repeated thermodilution cardiac outputs (minimum 3 measurements) were averaged and utilized as the basis of comparison for each method of non-invasive determination.

The CIRCUIT method had a correlation of r=.90; n=45 with thermodilution cardiac output. The TRANSFER method had a correlation of r=.92; n=45.

These methodologies represent accurate non-invasive alternatives to invasive thermodilution cardiac output and deserve further clinical evaluation.

Reference: Inter J Engin Sci 1972; 10:1081



TITLE: THE INCIDENCE OF MYOCARDIAL ISCHEMIA DURING WEANING AND EXTUBATION IN HIGH-RISK SURGICAL INTENSIVE CARE PATIENTS

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Weaning from mechanical ventilation is stressful and in patients with coronary artery disease may cause myocardial ischemia. We prospectively studied the incidence of myocardial ischemia during the weaning period among patients with risk factors for ischemic heart disease, who had undergone non-cardiac surgery. Unlike classic silent ischemia, this ischemia is "silent" due to sedation, narcotics, and/or the inability to communicate.

Forty patients meeting standard extubation criteria were randomized into 3 different modes of weaning: SIMV (n=12), T-Bar (n=14) and CPAP (n=14). Ischemia was monitored with a continuous two-lead (V5,II) ST segment analyzer (Qmed Inc. Monitor one, Clark, NJ 07066). Ischemia was defined as >1 mm ST segment depression 60 msec after the J point. The monitoring period included baseline monitoring (mean 11 hrs), weaning period (mean 45 mins) and postextubation period (mean 20 hrs). All determinations were made by a cardiologist blinded to the patient's type of weaning.

The overall incidence of ischemia during the monitoring period was 27.5% (11/40). Ischemia during weaning was detected in 3/14 T-Bar, 1/14 CPAP and 0/12 SIMV patients (Table).

This study demonstrates a high incidence of myocardial ischemia before, during and after weaning. Isolated ischemia occuring only during actual weaning was unusual, and the numbers are too small to make conclusions regarding the difference if any, of these three techniques. Further work is necessary to discern the clinical significance of this ischemia, the potential use of anti-ischemic agents, or new weaning modes in this setting.

	SIMV n=12	T-BAR n=14	CPAP n=14	TOTAL 40
Total Ischemia	3	5	3	11
Ischemia with weaning	0	3	1	4