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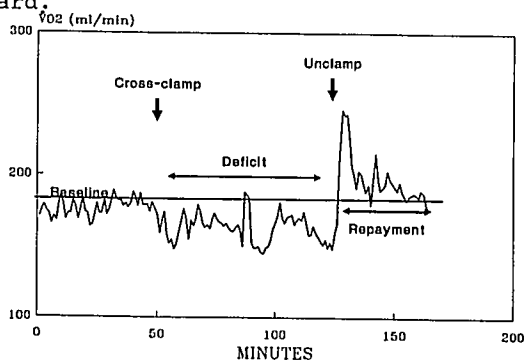
**TITLE:** ESTIMATION OF O<sub>2</sub> DEFICIT AND DEBT RESULTING FROM ABDOMINAL AORTIC CROSS-CLAMPING IN HUMANS

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Abdominal aortic cross-clamping creates a decline in oxygen consumption ( $\dot{V}O_2$ ) which, presumably, reflects anaerobic metabolism and O<sub>2</sub> deficit. Theoretically, the O<sub>2</sub> debt resulting from anaerobic metabolism should be equal to the O<sub>2</sub> repayment following restoration of aerobic metabolism. Further, the O<sub>2</sub> debt should exceed the O<sub>2</sub> deficit. We have attempted to quantify the O<sub>2</sub> deficit and the O<sub>2</sub> repayment associated with aortic cross-clamping and unclamping.

Seven patients undergoing abdominal aortic aneurysm repair were studied. Anesthesia was achieved with a high dose narcotic technique, and  $\dot{V}O_2$  was monitored with an indirect calorimeter.  $\dot{V}O_2$ -time curves were analyzed to determine the change in  $\dot{V}O_2$  compared to baseline (Figure). The decline in  $\dot{V}O_2$  during the period of cross-clamping was considered O<sub>2</sub> deficit, and the overshoot in  $\dot{V}O_2$  after unclamping, O<sub>2</sub> repayment. Values are reported as mean  $\pm$  SD [range]. The protocol was approved by our institutional review board.



The clamp time was 82.1 $\pm$ 15.8 mins [60-100], O<sub>2</sub> deficit was 1261.3 $\pm$ 402 ml [912.5-2009.9], and O<sub>2</sub> repayment was 594.3 $\pm$ 419.2 ml [354.4-1500]. The O<sub>2</sub> repayment was 47% [24.8-74.6] of the O<sub>2</sub> deficit. The difference between O<sub>2</sub> deficit and O<sub>2</sub> repayment was 661.8 $\pm$ 217.6 ml (p<.001).

The reason for the O<sub>2</sub> repayment being lower than the apparent O<sub>2</sub> deficit is unclear. Global or regional metabolic requirements may have been reduced during cross-clamping. Also, it is possible that the debt was not fully repaid during the study period. Which value, O<sub>2</sub> deficit or O<sub>2</sub> repayment, is more reflective of the actual O<sub>2</sub> debt remains to be clarified. The ability to quantify O<sub>2</sub> debt in this manner may have important applications in the management of patients undergoing aortic cross-clamping.

A114

**TITLE:** A SIMPLIFIED RISK SCORING SYSTEM FOR PATIENTS UNDERGOING CARDIAC SURGERY

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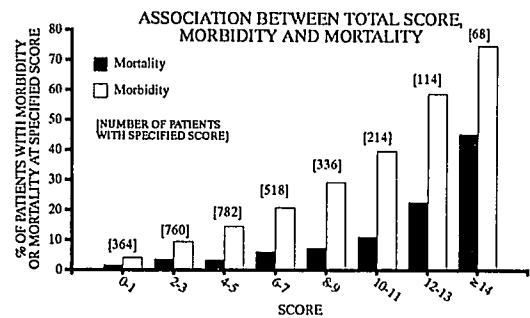
Although cardiac surgical patients have become increasingly older and debilitated, anesthesiologists have not had useful criteria to differentiate the risks of major complications after cardiac surgery. The ability to predict major complications after cardiac surgery would not only be useful to assess individual patient risk but also to plan perioperative management and better evaluate the effects of surgical, anesthetic and postoperative care. This study was undertaken to identify a method of estimating perioperative risk from readily available preoperative factors.

With IRB approval, 3156 consecutive adults undergoing cardiac surgery were prospectively studied. Significant univariate variables were entered into a stepwise logistic regression (LR) to determine multivariate predictors of morbidity (low CO syndrome, renal or pulm failure, stroke, serious infection) and mortality. LR analysis was applied to the overall population as well as CABG (n=2366) and valve procedures (n=790). A clinical risk score (RS) was developed from the LR.

One or more complications occurred in 13% of CABG patients and 27% of valve surgery patients. Factors predictive of morbidity were assigned points based on LR odds ratios:

Emergency	4	Pulmonary hypertension	2
Age 65-74 yr	1	Chronic Renal Failure	2
Age $\geq$ 75 yr	3	Preop Cerebrovasc Dis	2
CABG-valve	3	Female Gender	2
Multi-valve	2	LV Dysfunction (EF<.4)	1
MVR	2	Chronic Pulmonary Dis	1
AVR	1	Left Main CAD	1
MI < 3 months	2	Reoperation	1
MI 3-6 months	1	Diabetes	1
CHF	2	Cachexia	1

When applied to the CABG and valve populations individually, similar results were obtained. For patients with a 5% chance of morbidity, LR correctly predicted 293 of 301 patients to be free of morbidity (RS $\leq$ 2). LR correctly predicted 6 of 6 patients with morbid events who had a  $\geq$ 80% chance of morbidity (RS $\geq$ 17). The relationship between summated risk score and morbidity/mortality is shown below.



While considerable information has been published on preoperative predictors of mortality after cardiac surgery, few studies have assessed such predictors of major complications after cardiac surgery. As an increasing number of operations are performed on older and sicker patients with severely impaired subsystems, a scoring system such as that presented will gain increasing utility. If validated by prospective multicenter application, such a method may allow preoperative estimation of risk independent of surgical and anesthetic variables.